Transplant International

INVITED COMMENTARY

The cost of sarcopenia

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Transplant International 2018; 31: 155–156

Received: 4 September 2017; Accepted: 8 September 2017

van Vugt *et al.* [1] found that sarcopenia is an independent risk factor for increased hospital costs for liver transplant candidates. They report that diminished muscle mass measured on CT imaging as the skeletal muscle index (SMI, cm^2 muscle area/m^2 patient height) is strongly associated with increased hospitalizations and cost of care. The association was significant on multivariable modeling adjusted for potential confounders. This original observation using an anatomic muscle mass measurement is consistent with work showing that physical frailty measured by gait speed indicates similar risk for increased hospitalization and healthcare costs in such patients [2].

While added costs for liver transplant candidates impose a burden for health systems, they represent an important surrogate marker for the added distressing human cost of illness and disability imposed on transplant candidates by frailty and sarcopenia. Can these human and financial costs be offset or minimized by targeted interventions?

Such interventions are beginning to appear. New information on definition, mechanisms, and measurement of cirrhotic sarcopenia now promises to become actionable, as suggested by the authors. Ammonia excess in cirrhosis is now recognized as the central disturbance responsible for dysregulated muscle protein biosynthesis, catabolism, and function [3]. Cirrhotic sarcopenia is partially reversible in experimental animals by ammonia-lowering therapies [4]. Standardized measurement cutoffs and robust associations with transplant-related outcomes were recently reported for anatomic sarcopenia SMI values [5] and for a new liver frailty index measurable at wait-list clinic visits that merit broad adoption [6].

Since 2014, eight new human studies have reported improvement in cirrhotic sarcopenia and frailty using structured exercise, and nutritional, metabolic, and hormonal interventions [7–14]. It now appears that the cost of treating sarcopenia could be easily sustainable if it avoided the excess hospitalization costs that van Vugt *et al.* found for sarcopenic patients.

doi:10.1111/tri.13069

The most formidable remaining obstacle in arresting sarcopenia may be the reluctance of transplant candidates and their caregivers to add another demand, especially exercise, to an already-difficult care regimen. Nearly all cirrhotic patients experience decreased energy as a cardinal manifestation of their disease. After transplant evaluation and wait-listing, many would prefer to simply rest while awaiting a donor organ. Their objectively monitored activity levels are among the lowest of any patients with chronic diseases [15]. If we are to avoid the high human and resource costs imposed by sarcopenia that the authors describe, it will be necessary to fundamentally change core processes and priorities in pretransplant care, and by extension, cirrhosis care in general.

Funding

The author has declared no funding.

Conflicts of interest

The author has declared no conflicts of interest.

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